

Examiners' Report

June 2014

IAL Biology WBI01 01

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Introduction

This paper tested the knowledge and understanding of the two AS topics: 'Lifestyle, health and risk' and 'Genes and health', together with elements of How Science Works. The range of questions provided plenty of opportunity for candidates to demonstrate their grasp of these AS topics. On the whole, candidates coped extremely well with this paper, finding most of the questions straightforward to tackle; indeed there were very few examples of questions not being attempted at all, with all questions achieving the full spread of marks.

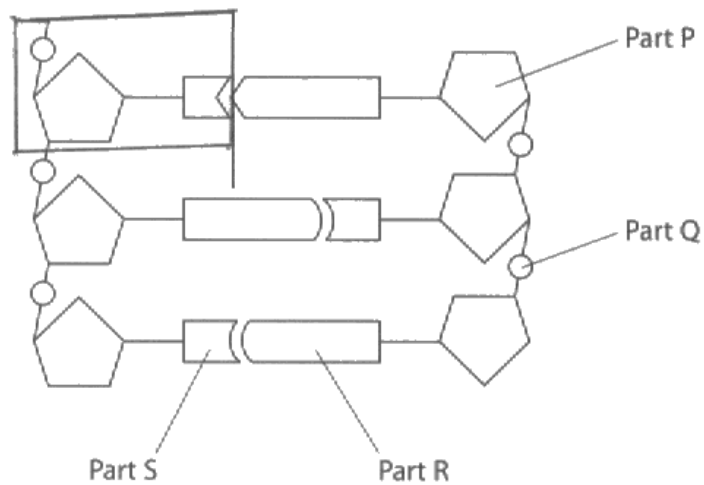
It was good to see how well many candidates could recall several areas of the specification in a good level of detail, including the core practical for measuring the heart rate in *Daphnia*. It was also very pleasing to see very few candidates losing marks for poor quality of written communication (QWC), with answers often set out in a logical style with key biological terms spelt correctly.

Some candidates let themselves down by not reading the questions carefully enough, or by providing a response without the precision required at this level.

Many candidates have clearly made good use of past papers and mark schemes, but it is important for candidates to understand the scientific principles covered in the specification so they can apply them to new contexts and not write a rehearsed answer to a question that has been asked in the past.

Question 1 (a) (v)

The question was answered well by the majority of students. A small number of students identified a base or nucleoside rather than a nucleotide.



(v) On the diagram of the section of DNA, draw a box round **one** mononucleotide.

(1)



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Examiner Comments

This was a typical response and was awarded one mark.



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Examiner Tip

Take care to follow any instructions given in a question. In this question students were asked to draw a box around a nucleotide. Some students drew a nucleotide elsewhere on the paper and risked losing the mark.

Question 1 (b)

Students generally demonstrated a good understanding of the process of DNA replication, with many scoring maximum marks for this question. Students generally lost marks when they did not include sufficient detail in their answers. Some students used terms such as, hydrogen bonding or complimentary base pairing in a way that was confusing or demonstrating a misunderstanding of what the term meant.

(b) Describe the replication of DNA.

(5)

DNA replication is semi conservative. The DNA double helix unwind and the hydrogen bonds joining the complimentary bases break with the help of DNA helicase. Free nucleotides are attracted to the exposed DNA bases. The ~~is~~ free nucleotides align themselves opposite each DNA strand as it acts as a template to form the copied strand. The sequence of free nucleotide arrange themselves in a sequence that is complimentary to the template strand. Condensation reactions then occur between the nucleotides joining them together with the help of DNA ligase and polymerase. New hydrogen bonds form between the complimentary base ~~as~~ and the two ~~p~~ each pair of strand reverts into a double helix. The final result is two DNA molecules each with one original and one new strand of DNA.

(Total for Question 1 = 10 marks)



ResultsPlus
Examiner Comments

This is an example of a detailed description of DNA replication which gained a maximum of five available marks from mark points 1, 2, 5, 3, 4 and 7. The only mark point not covered in the answer was mark point 6.

(b) Describe the replication of DNA.

(5)

In the nucleus the helix structure of the DNA opens through the help of DNA helicase. This enzyme helps to uncoil the DNA. When the strands are separated the mRNA allows the codes on the strand to be copied and hence form a template strand. Then the tRNA copies the anti-codons from the sense strand and allow their message to go to the ribosomes where now the amino acid sequence opens and the amino acid is made. But before the tRNA does this the mRNA copies the codons from the anti-sense strand then the tRNA copies the anti-codons and thus the DNA replication is complete when the sequence of amino acids is formed.

(Total for Question 1 = 10 marks)



ResultsPlus

Examiner Comments

In this answer the student confused DNA replication with RNA transcription. The first sentence described DNA helicase unwinding double stranded DNA, gaining two marks mark points 2 and 7. The student then began to describe the transcription of mRNA and no further marks were gained.



ResultsPlus

Examiner Tip

Read questions carefully and make sure you answer the question that is asked. If you mix up important processes such as DNA replication and mRNA transcription the examiner may not be able to award any marks, even if what you write is correct biology.

Question 2 (a) (i)

The majority of students were able to answer this question and gain both available marks.

(a) (i) The table below shows the time taken for each stage of one cardiac cycle.

Complete the table with the name of each stage.

(2)

Stage of cardiac cycle	Name of stage	Time taken / s
Contraction of the atria	Systole	0.1
Contraction of the ventricles	Systole	0.3
Relaxation of both atria and ventricles	Diastole	0.4



ResultsPlus Examiner Comments

On this occasion correct use of the terms systole and diastole was sufficient for both marks.



ResultsPlus Examiner Tip

When asked for a name of a stage, always try to give the full name. In this case, atrial systole, ventricular systole and, atrial and ventricular diastole.

(a) (i) The table below shows the time taken for each stage of one cardiac cycle.

Complete the table with the name of each stage.

(2)

Stage of cardiac cycle	Name of stage	Time taken / s
Contraction of the atria	atrial systole	0.1
Contraction of the ventricles	ventricular systole	0.3
Relaxation of both atria and ventricles	diastole	0.4



ResultsPlus Examiner Comments

Another example in which both marks were awarded.

Question 2 (a) (ii)

Many students appreciated what they needed to do to find the heart rate and were able to carry out the calculation successfully. Of those students that did not complete the calculation successfully, most divided the time taken for one beat, 0.8 by 60. Other student gave incorrect answers but did not show any workings, so it was not possible to determine if they could be awarded the mark for correct workings.

(ii) Using the information in the table, calculate the heart rate in beats per minute.

Total time for heart cycle is 0.8 seconds (2)
1 Beat in 0.8 seconds
75 in ~~60~~ 60 seconds 75 beats per minute

$$\frac{60}{0.8} = 75$$



ResultsPlus Examiner Comments

This example gained both marks for a correct calculation that was clearly laid out.



ResultsPlus Examiner Tip

When appropriate show your workings.

Question 2 (b) (i)

The majority of students successfully read of the maximum pressure from the graph and gained this mark. When the mark was not awarded it was generally because the students did not give units.

Question 2 (b) (ii)

Many students recognised that an increase in pressure in the ventricle supported the idea that the atrio-ventricular valve was closed. Fewer students recognised that a lower pressure in the atrium than the ventricle also supports this idea. Only a relatively small number of students gave both pieces of evidence.

A frequent mistake was to simply state that the pressure increased in the ventricle and fell in the atrium. This would gain the first mark point but not the second. For the second mark students needed to say the pressure was lower in the atrium than in the ventricle.

In this answer the student has described the increase in pressure in the ventricle gaining the first mark point.

(ii) At point **A**, the atrioventricular valve closes.

Explain the evidence from the graph which supports this statement.

(2)

The evidence is that the ~~left ventricle's~~ blood pressure in the left ventricle gets drastically higher, which is caused by the atrioventricular valve closing



ResultsPlus
Examiner Comments

In this answer, the student gave one correct piece of evidence and gained one mark.



ResultsPlus
Examiner Tip

In a question like this one, when there are two marks available and you are asked to explain the evidence, your explanation should refer to two distinct pieces of evidence.

(ii) At point **A**, the atrioventricular valve closes.

Explain the evidence from the graph which supports this statement.

(2)

At point A, the pressure in the left ventricle increases beyond the pressure of the left atrium. This is because the ventricles begin to contract. At this point the atrioventricular valve closes to prevent backflow of blood into the atrium.



ResultsPlus

Examiner Comments

In this answer the student gained both marks by describing the pressure in the ventricle increasing above the pressure in the atrium.

Question 2 (b) (iii)

Many students gained one mark for describing the flow of blood from the ventricle to the aorta. Fewer students managed to relate this to the opening of the semilunar or aortic valve and consequently mark point 2 was less frequently awarded.

(iii) Describe what happens in the heart to bring about the changes shown at point B on the graph.

(2)

Blood moves in high pressure from the left ventricle to the aorta and hence an increase in aortic pressure, this is shown at B



ResultsPlus

Examiner Comments

This is a fairly typical student response. This response gained one mark for describing the movement of blood from the ventricle into the aorta.

The marks are for what is happening in the heart to cause the increase in aortic pressure. So students did not gain credit for describing what the graph showed e.g. an increase in aortic pressure.



ResultsPlus

Examiner Tip

When you are asked to describe something, make sure you give the description you are asked for.

(iii) Describe what happens in the heart to bring about the changes shown at point **B** on the graph.

(2)

The pressure in the left ventricle is very high, and it gets to a point where it is high enough to open the semilunar valve. This happens because at point B the pressure in the left ventricle has become higher than in the aorta and so the valves open for the blood to go through.



ResultsPlus
Examiner Comments

In this answer, the student gained both available marks. The first mark was given for the opening of the semilunar valve. The second sentence was considered to be a sufficient description of the movement of blood from the ventricle to the aorta so the second mark was also awarded.

The second sentence, by itself, would not have gained the first mark as the valve is not named in this sentence.



ResultsPlus
Examiner Tip

When naming structures in descriptions make sure you use the full correct names of the structures.

Question 2 (b) (iv)

Many students struggled with this question. Rather than explain the changes in pressure many simply described them.

The most frequently awarded mark was for the idea that the semilunar valve has closed. Some also made reference to elastic recoil and gained MP 3. Very few mentioned elastic fibres and their stretching (MP 1 and 2).

Numerous responses were seen in which students incorrectly referred to contraction and relaxation of the aortic wall.

(iv) Explain why there are pressure changes in the aorta at C on the graph.

(3)

Because the blood is received and is now heading out of the heart and aorta to branched arteries so aorta relaxes and pressure increases. At C the semilunar valve shuts as pressure in aorta is higher and prevents backflow. C marks total diastole where the heart relaxes.

(Total for Question 2 = 12 marks)



ResultsPlus

Examiner Comments

In this response the student gained one mark for reference to the semilunar valve closing. The rest of the response did not address the question and gained no credit.



ResultsPlus

Examiner Tip

Questions will often ask you to explain a feature of a graph or diagram. When tackling these questions make sure you identify the feature you need to explain before attempting the question. Then make sure you link your answer to the feature.

(iv) Explain why there are pressure changes in the aorta at C on the graph.

(3)

Semilunar Valves close because of diastole.
High pressured blood entry stopped so pressure
in aorta slightly decrease but aorta maintain
pressure by stretch and ~~recoil~~ elastic recoil
so pressure in aorta not fall dramatically.



ResultsPlus
Examiner Comments

This response was given three marks. In this response the student has correctly identified that the semilunar valve is closed and has described the stretch and elastic recoil of the aorta. The response could have been improved if the student had made clearer reference to the stretching and recoiling of the aorta wall. The student should also have explained the roll of elastic fibres.

Question 3 (a) (iii)

This question was generally answered well. Most students correctly identified the hydrophobic and hydrophilic parts of the phospholipid molecule. Many then went on to explain how the interaction of these structures with water determined their orientation and the formation of a lipid bilayer.

(iii) Explain how the properties of the parts labelled **A** and **B** contribute to the structure of the cell surface membrane.

(3)

The hydrophobic tails labelled A and the hydrophilic phosphate heads labelled B, contribute to the structure of the cell surface membrane, as they help form the phospholipid bilayer of the cell surface membrane, with the fluid mosaic model. The hydrophilic heads are attracted to the water and the hydrophobic tails remain on the inside, where they have no contact with the water in order to remain undissolved. Hence, the phospholipid bilayer of the cell surface membrane is formed.



ResultsPlus
Examiner Comments

This is an example of a response that gained all three available marks. The student clearly identified the relevant properties of the structures A and B and described how they orientate themselves relative to water.

(iii) Explain how the properties of the parts labelled **A** and **B** contribute to the structure of the cell surface membrane.

(3)

The properties of the parts labelled A and B contribute to the structure of the cell surface membrane by being water repellent and acting as a barrier to materials trying to enter the cell membrane.



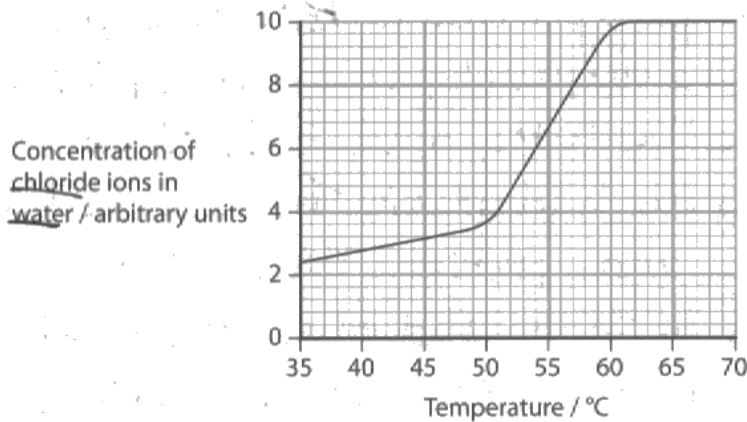
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Examiner Comments

In this response the student did not address the question. The properties of the parts labelled A and B were not given and the orientation of the molecules with regard to water was not described.

Question 3 (b) (i)

(b) When pieces of carrot tissue are placed in distilled water, chloride ions are released from the cells into the water.

The graph below shows the effects of temperature on the release of chloride ions from carrot cells.



(i) Using the information in the graph, describe the effect of temperature on the release of chloride ions from the cells of the carrot.

(3)

As temperature increases the release of chloride ions from the cells increases. It moves slowly at first - from 2.5 to 3.9 from 35°C to 50°C, then it goes rapidly from 4 to 10, which is an increase of 6. It then plateaus from 60°C and remains at 10 units.



ResultsPlus Examiner Comments

This is an example of a good response that gained all three available marks. The student described the general trend for one mark and the changes between 35 and 60°C for a second mark. A third mark was gained for describing concentration remaining constant after 60°C.

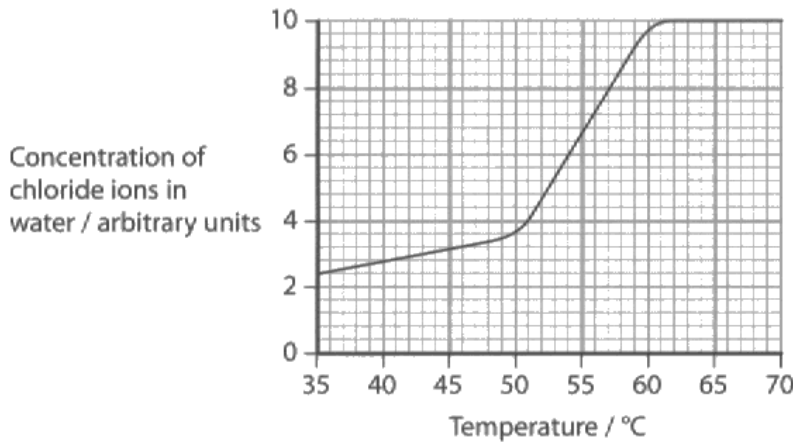


ResultsPlus Examiner Tip

When describing data in a graph or table remember to describe the overall or general trend as well as any specific detail.

- (b) When pieces of carrot tissue are placed in distilled water, chloride ions are released from the cells into the water.

The graph below shows the effects of temperature on the release of chloride ions from carrot cells.



- (i) Using the information in the graph, describe the effect of temperature on the release of chloride ions from the cells of the carrot.

(3)

The higher the temperature the greater the concentration of chloride ions in water, up until 61°C, after this temperature the concentration of chloride ions in water stays the same. At 35°C there are 2.2 arbitrary units of Cl⁻ in water, and at 61°C there are 10, which is 7.8 arbitrary units more for 26°C increase.



ResultsPlus Examiner Comments

In this response the student gained one mark for the general trend of increased chloride ions with increased temperature. A second mark was gained for describing the plateau after 61°C. The manipulation of data mark was not awarded because the student misread the scale on the y-axis and used the wrong value for 35°C.



ResultsPlus Examiner Tip

Take care when reading values from a graph - double check the scale used.

Question 3 (b) (ii)

Many students struggled to explain the changes shown in the graph and described in 3(b) (i). Often students described changes in the rate of diffusion of chloride ions. Students often failed to make the point that movement of chloride ions out of the cell would be by diffusion and that diffusion increases as temperature increases. A number of students also, incorrectly, suggested that concentration of chloride ions stopped increasing in the solution because all the chloride ions had left the tissue.

*(ii) Explain the reasons for the changes you have described.

(4)

Between 35-50°C: Cl^- ions leave the carrot tissue by diffusion as they are more concentrated in the root cells. The higher As the temperature increases, the phospholipids have more kinetic energy and move further apart, increasing the rate of diffusion of the ions.

Between 50-60°C: The higher the temperature the more damaged the phospholipid bilayer becomes, as its proteins become denatured and the cell membrane loses its structure, allowing Cl^- ions to freely move out of the cells. After 60°C: All the Cl^- ions in the carrot tissue has diffused out, so the concentration no longer changes.

(Total for Question 3 = 12 marks)

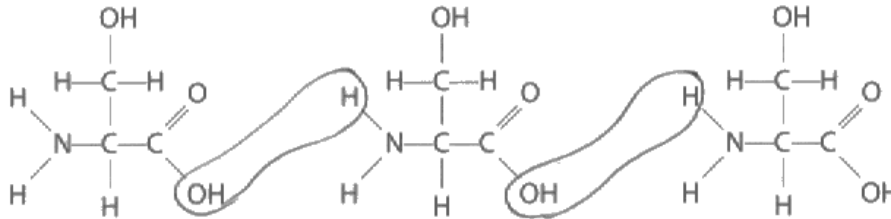


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Examiner Comments

This is an example of a good response. The student identifies diffusion as the key process by which chloride ions move across the membrane (mark point 1) and that increased temperature increases the rate of diffusion (mark point 3). The student then suggests that at temperatures above 50°C the membrane is damaged (MP4) and links this to protein denaturation (mark point 5). The explanation for concentration remaining constant after 60°C is incorrect and would not have gained a mark. The QWC mark was not deducted as the explanation was sufficiently organised and clearly expressed.

Question 4 (a) (i)

This question was generally answered well. The preferred answer was two circles showing the two condensation reactions between the amino acids. Each circle around the H from an amino group and the OH from a carboxylic acid group. On this occasion individual circles around the relevant H and OH groups was accepted.



- (a) (i) Draw a circle around each of the parts of these amino acids that would be removed when they join together in the formation of a protein.

(2)



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Examiner Comments

This is an example of a correct answer that gained both marks.

Question 4 (b) (i)

This question was generally answered well with many students able to explain the term primary sequence. Omitting reference to the idea of a sequence, or order, of amino acids was the most frequent reason for losing the mark. Some students did not gain the mark because they described incorrect bonding between the amino acids forming a polypeptide chain, e.g, glycosidic or hydrogen bonds.

(b) (i) State what is meant by the term **primary structure** of a protein.

(1)

It is the linear sequence of amino acids in a peptide polypeptide



ResultsPlus

Examiner Comments

This is a good response in which the student has clearly described the term primary sequence.

(b) (i) State what is meant by the term **primary structure** of a protein.

(1)

The primary structure of a protein is made up of one single strand which does not recort or fold over itself. It is the simplest of all three structures in a protein.



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Examiner Comments

The student did not gain a mark for this response as they did not make reference to amino acids or to the idea of a sequence or order of amino acids.

Question 4 (b) (ii)

This question discriminated across the ability range. Most students gained some credit and some gained all five available marks. Many students demonstrated an understanding of the link between primary structure and the properties of an enzyme. However, responses were often too confused or lacked sufficient detail to gain many marks. Mark points four and five were seen infrequently. The QWC was assessed against spelling of technical terms. Relatively few students lost this mark.

* (ii) Enzymes are proteins.

Explain how the primary structure of an enzyme determines its three-dimensional structure and properties.

(5)

The primary structure sequence determines the position of the R groups which further determine the type and position of bonds (ionic, disulphide bridges, hydrogen bonds). The primary structure folds into a 3-D, globular structure with a specific shape which gives enzyme a specific active site. The R groups in the structure are such that the exterior R groups are hydrophilic and the interior ones are hydrophobic making enzymes soluble.

(Total for Question 4 = 9 marks)



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Examiner Comments

This is an example of a concise answer that gained all five available marks. In the first three lines the student describes the importance of the primary structure in determining the type and position of bonds and names two relevant types of bond - gaining mark points 1, 2 and 3. The student then goes on to describe how this forms a molecule with a specific shape with a specific active site, mark point 6. Finally, the student describes the orientation of the hydrophobic and hydrophilic groups and how this makes the enzyme soluble, gaining mark points 4 and 5.

*(ii) Enzymes are proteins.

Explain how the primary structure of an enzyme determines its three-dimensional structure and properties.

(5)

The sequence of amino acids form repeating structures coding for a particular protein. The structures formed coil and fold due to hydrogen bonds formed in them, forming three dimensional structures. The different polypeptides formed link and coil with the help of hydrogen bonds and sulfur bridges. These structures form a globular structure giving them shape. The active sites formed are due to information coded by the sequence of amino acids present, each different forming different active sites in different enzymes.

(Total for Question 4 = 9 marks)



ResultsPlus
Examiner Comments

This is an example of a response in which the student gained three marks. These were awarded for mark points 2, 3 and 5. The first sentence was not sufficient for mark point 1 and the last sentence was not sufficient for mark point 6. No deduction was made for QWC as technical terms were spelt correctly.

Question 5 (a)

Most students recognised that cardiovascular disease was a disease of the heart or blood vessels and gained the first mark point. Many then gave an example of a disease process such as atherosclerosis gaining the second mark. The second mark required either a reasonable description of the disease process (narrowing of the lumen/reduced blood supply) or use of a suitable technical term describing the pathology (thrombus/ischemia). Many students gave the outcome or end result of cardiovascular disease e.g heart attack and did not get the second mark.

(a) Explain what is meant by the term **cardiovascular disease**.

(2)

Cardiovascular diseases is the term given to diseases affecting the circulatory system which includes the heart, the veins, arteries and capillaries.

Heart attack is an, atherosclerosis & are examples of cardiovascular diseases.



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Examiner Comments

In this response the student has clearly identified the heart and blood vessels as the site of cardiovascular disease for one mark and atherosclerosis as an example of the pathology of cardiovascular disease for the second mark. Heart attack was ignored.



ResultsPlus

Examiner Tip

Read questions carefully. This question asks what cardiovascular disease is, not what the outcome of cardiovascular disease is.

(a) Explain what is meant by the term **cardiovascular disease**.

(2)

Disease caused by high blood pressure that can
cause heart attack or stroke



ResultsPlus
Examiner Comments

In this response the student has identified high blood pressure as a disease process associated with cardiovascular disease and gets the second marking point.

Question 5 (b)

The response to this question was disappointing with the majority of students apparently unfamiliar with this way of presenting data. Many students thought the 100,000 referred to the number of individuals studied and suggested that CVD affects large numbers of people or that carrying out the study on a large number of people gives more valid data.

(b) Suggest why the deaths from CVD are expressed as the number of deaths per 100 000 of population.

(1)

Because it is a ~~the~~ number large enough to represent the population and a number small enough to fit in a graph.



ResultsPlus
Examiner Comments

In this response the student has made two suggestions, neither of which is sufficient to gain the mark.



ResultsPlus
Examiner Tip

In Biology, data is presented in lots of different ways. Whenever you come across a table or graph presenting data, take time to think about the column headings and axis labels paying special attention to any units.

(b) Suggest why the deaths from CVD are expressed as the number of deaths per 100 000 of population.

(1)

The ~~population~~ total population may differ from one country to another, so this makes comparisons more easy to make.



ResultsPlus
Examiner Comments

This is an example of a good response in which the student correctly describes the reason for using deaths per 100,000.

Question 5 (c) (i)

Many students gained one mark for this question, recognising that the death rate in men is higher than death rate in women (MP1). Some also used the data to make a relevant comparison between men and women (MP4). Simply restating values from the graph was not sufficient for this mark point. Students needed to manipulate or process the data an appropriate way. Very few students gained either mark point 2 or 3. Many students misread the scale on the graph and therefore carried out incorrect manipulations. A large number of students made general comments about death rates and did not compare men with women.

(c) (i) Using the information in the bar graph, compare the number of deaths for men with the number of deaths for women.

(2)

In all the countries the men death numbers are higher than those for women.

the range for women = ~~620~~ - 120
= 500

the ~~range~~ for men = 1040 - 160 = 880



ResultsPlus
Examiner Comments

Two marks were gained for this response. The first mark for identifying more men die from CVD than women in all countries and the second for correctly determining and comparing the range of values for men and women.

(c) (i) Using the information in the bar graph, compare the number of deaths for men with the number of deaths for women.

(2)

In almost all countries, more men die of CVDs than women do. In countries like Russian Federation and Estonia, there is an almost $\frac{1}{3}$ more men who die of CVDs than the number of women dying of CVDs.



ResultsPlus
Examiner Comments

In this response the student has correctly stated that the death rate in men is higher than the death rate in women, mark point 1. However, the second statement is not developed sufficiently to gain another mark. In this case stating that the number of men is $\frac{1}{3}$ greater than the number of women dying from CVD in the Russian Federation adds very little to the idea that more men die from CVD than women and does not gain a mark. If the student had compared this with Spain where numbers are very similar that would have gained the second mark.



ResultsPlus
Examiner Tip

When asked to compare data think about what the data is showing. For each available mark you should try to suggest something different.

Question 5 (c) (ii)

Many students scored well with this question. Often students identified two sensible risk factors and suggested a difference in risk factor between countries. Relatively few students suggested differences in healthcare or health education (mark points 4 and 5).

(ii) Suggest explanations for the differences in the number of deaths from CVD in these countries.

(4)

Men may be smoking more than women do in all the countries used. In some countries, ^{such as Ukraine} they may have a higher salt diet than in other countries such as Spain and the Netherlands. ~~The~~ The people in the countries such as Ukraine, Russian Federation might not exercise as regularly as the people in Spain and Netherlands do. On the other hand, it might have been genetic in Ukraine more than in Greece and Slovakia and that could have increased the risk of getting CVDs in comparison to other countries.

(Total for Question 5 = 9 marks)



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Examiner Comments

This is an example of a fairly typical response to this question. The student has suggested that there is a difference in risk factors between the countries (mark point 1) and identified at least two relevant risk factors (mark points 2 and 3).

(ii) Suggest explanations for the differences in the number of deaths from CVD in these countries.

(4)

Some countries have better ~~•~~ and more affordable health care than others. These countries also have better regulation of food and the ~~the~~ citizens are more educated on the matter of CVDs which means they might smoke less, exercise more and eat more healthy. These countries might also have cheaper medicine, cheaper hospitals ^{or} better hospitals and doctors.

(Total for Question 5 = 9 marks)



ResultsPlus
Examiner Comments

This is an example of a good response that gained all four available marks. The student first identified differences (mark point 1) in healthcare and education (mark points 4 and 5) before going on to suggest differences in two specific risk factors (mark points 2 and 3).

Question 6 (a)

The majority of students were able to correctly calculate the surface area to volume ratio. Many students simply rewrote or made some irrelevant change to the surface area and volume values given in the table. Other students gave the ratio back to front, giving the volume to surface area rather than surface area to volume ratio or simply stated the number 6, which by itself is not a ratio.

(a) The student calculated the surface area to volume ratio of sphere A as 2:1.

Calculate the surface area to volume ratio of sphere B.

(1)

$$3.14 : 0.52$$
$$6 : 1$$

Answer = 6:1



ResultsPlus
Examiner Comments

This is a response that shows the correctly calculated ratio.



ResultsPlus
Examiner Tip

When giving a ratio, you should give the first term as a multiple of the second term. In this case surface area as a multiple of the volume. It is also good practice to give the simplest whole number ratio, rather than use fractions or decimals (at least for the second term).

(a) The student calculated the surface area to volume ratio of sphere A as 2:1.

Calculate the surface area to volume ratio of sphere B.

(1)

$$\frac{3.14}{0.52}$$

Answer = 1 : 6



ResultsPlus
Examiner Comments

In this response the student has written the ratio the wrong way around and did not gain a mark.

Question 6 (b) (i)

This question proved straightforward for most students. However, a disappointing number of students suggested answers such as 'thin membranes' or 'one cell thick' which could not be credited.

(i) State **one** feature, other than a large surface area, of a gas exchange surface. (1)

blood supply



ResultsPlus

Examiner Comments

In this response the student has not provided sufficient detail and did not gain a mark. If they had said 'a good blood supply' that would have been sufficient to gain the mark.



ResultsPlus

Examiner Tip

Always make sure you provide a complete answer. The examiner has no idea what you are thinking, so can not give a mark unless you provide the full answer.

(i) State **one** feature, other than a large surface area, of a gas exchange surface. (1)

Short diffusion distance



ResultsPlus

Examiner Comments

In this response the student suggests a 'short diffusion distance' to gain the mark.

Question 6 (b) (ii)

This question proved difficult for many students. Frequently, students recognised that multicellular animals would have a relatively small surface area to volume ratio (mark point 2). However, they did not clearly link this to a reduced surface over which exchange by diffusion can take place (mark point 1). Similarly, many students did not clearly express the idea that inside a multicellular organism the process of diffusion would be too slow. Therefore multicellular organisms need a transport system. Many students made comments about diffusion being insufficient, however unless these were qualified they did not gain either mark point 1 or 4.

(ii) Explain why multi-cellular animals require a respiratory system and a circulatory system.

(4)

Animals are multi-cellular and has a ~~large~~ low surface area to volume ration. This increases the diffusion distance. Thus diffusion only would not be sufficient to supply and remove materials rapidly at a rate to sustain metabolism. However, a circulatory system provides a mass flow of blood and ensures that all tissues and cells are surrounded by a network of capillaries to supply oxygen and remove carbon dioxide rapidly. A respiratory system provides a large surface area for gas exchange. Moreover, ~~oxygen~~ gas exchange can occur at a small diffusion distance due to a respiratory system.

(Total for Question 6 = 6 marks)



ResultsPlus

Examiner Comments

This is an example of a good answer for which the student gained a maximum of four marks. In this response the student could have gained these from five mark points (2, 1, 6, 5 and 3).

(ii) Explain why multi-cellular animals require a respiratory system and a circulatory system.

(4)

They require a respiratory system because multi-cellular animals have a small surface area to volume ratio, so simple diffusion would be too slow as a long distance is involved. So the circulatory system is needed to transport oxygen and glucose to the rest of the body as multi-cellular organisms are metabolically active and need a lot of oxygen. The waste material also needs to be removed very quickly so a double circulation is used.

(Total for Question 6 = 6 marks)



ResultsPlus
Examiner Comments

This is an example of a good response for which the students have gained three marks (mark points 2, 4 and 5).

Question 7 (a) (i)

For this question students needed to describe the overall trends in consumption of low fat margarine and butter in men. The small number of students that answered the question asked, generally scored well. A disappointing number of students compared men with women or broke the graph in to small parts describing each period rather than the general trend.

(a) (i) Using the information in the graph for **men**, describe the trends in consumption of low fat margarine and butter.

(3)

For men, low fat margarine consumption goes down by 2.4 units ~~from~~ from 1990 to 2000. Then it increases by 0.8 and then decreases again from 2005 to 2010 by 3.4 units. Butter decreases ~~very~~ ~~bit~~ a bit by 0.5 ~~in~~ from 1990 ~~to~~ 2000. And then it increases by a little bit.



ResultsPlus Examiner Comments

In this response the student has split the graph into small parts and described these. No attempt was made to describe the actual trends. Since the question asks for a description of the trends, no marks could be awarded for this response.



ResultsPlus Examiner Tip

When asked to describe trends illustrated in data you should be thinking about the general pattern or overall changes shown. This can be different to simply describing the data.

(a) (i) Using the information in the graph for **men**, describe the trends in consumption of low fat margarine and butter.

(3)

- Overall the consumption of low fat margarine and butter has decreased
- The consumption of low fat margarine is greater than butter
- The ~~margin~~ weekly in take of low fat margarine is dropped by ^{4.7}~~4.75~~ arbitrary units from 1990-2010.
- The weekly in take of ~~low fat~~ butter dropped by 0.4 arbitrary units from 1990-2010



ResultsPlus Examiner Comments

This is an example of a good response that gained all three available marks. The student has identified two significant trends: margarine consumption has fallen and butter consumption has remained fairly constant (mark points 1 and 2). The student then carried out two data manipulations. The first was incorrect and was ignored on this occasion. The second manipulation of data was correct and was awarded a mark (mark point 4).

Question 7 (a) (ii)

Many students described differences in margarine and butter when they were asked for differences in intake of margarine in men and women. As in part (i) students that answered the question asked, generally scored well. Students often gained the first and third mark points. The second marking point was rarely seen.

(ii) Using the information in both graphs, give **two** differences between the weekly intake of low fat margarine of men and women. year 2010

(2)

- 1 Women consume a higher amount of low fat margarine than men in their weekly intake.
- 2 The graph for women shows only a downward trend while the men fluctuate from a decrease to an increase to again a decrease.



ResultsPlus
Examiner Comments

This response gained both available marks (mark points 1 and 3).

(ii) Using the information in both graphs, give **two** differences between the weekly intake of low fat margarine of men and women.

(2)

- 1 Women has high intake of low fat margarine compared to ~~women~~ men.
- 2 Men has high intake of ~~Butter~~ butter compared to women.



ResultsPlus
Examiner Comments

For this response one mark was awarded for the first statement that margarine consumption was higher in women than in men. The second statement did not gain any credit because although correct, it is a statement about butter consumption and the question asks about margarine consumption.



ResultsPlus
Examiner Tip

Read questions carefully and always check you have answered the question that was asked.

Question 7 (b) (i)

Many students failed to gain any marks for this question. Those that did gain a mark generally suggested people might leave the area or might die during the study (mark points 1 or 2).

A surprisingly large number of students suggested that the diet of participants might change over time. Since this was what the study was investigating these responses did not gain a mark.

(b) (i) The scientists planned to continue the study with the same group of men and women.

Suggest **two** reasons why this was difficult to achieve.

(2)

1. The men or women may decide they want to leave the country, and migrate, it would be hard to get data from outside, and it would change the variables of the experiment ^{and outcome.}
2. Over the years men and women may get bored, and change their eating habits, they may give false answers, also as age increases a change in diet is necessary.



ResultsPlus

Examiner Comments

In this response the first suggestion gained a mark (mark point 1). The second suggestion described changes in eating habits (diet) this was not accepted since this was the point of the study.

(b) (i) The scientists planned to continue the study with the same group of men and women.

Suggest **two** reasons why this was difficult to achieve.

(2)

1 Some people might have died and ~~would~~ couldn't be included for the study.

2 ~~So~~ Some people may ~~be~~ have shifted from one place to the other and so they weren't available for the study.



ResultsPlus
Examiner Comments

In this response the student made two sensible suggestions and gained both available marks (mark points 1 and 2).

Question 7 (b) (ii)

The majority of students gained at least one mark for this question. Frequently, students suggested correctly that an advantage of using questionnaires was that they saved time or were easier to administer. Many students also suggested that a disadvantage to questionnaires was that the information collected may not be accurate.

(ii) The information in the graphs was collected using questionnaires that were completed at home.

Suggest **one** advantage and **one** disadvantage of using this method of data collection, rather than face-to-face questioning by the scientists.

(2)

Advantage It is time saving as the scientists do not have to go to each and every persons home to question them face-to-face.

Disadvantage It may be biased, the people may not be saying the truth, they can be influenced by other people.

(Total for Question 7 = 9 marks)



ResultsPlus
Examiner Comments

In this response the student identified a sensible advantage and disadvantage of the use of questionnaires gaining both available marks.

Question 8 (a)

Students generally appeared familiar with this core practical and correctly described how to immobilise *Daphnia* with cotton wool strands. Many also describe appropriate placement of the thermometer. Very few mentioned positioning the *Daphnia* so its heart could be observed.

(a) Suggest how the student should position the *Daphnia* and the thermometer in order to obtain valid results.

(3)

The *Daphnia* should be in some cotton wool so that it is not moving around and doesn't get onto the thermometer which will be placed further from the cotton wool and all the bulb on the thermometer will be inside the petri dish in order to get accurate readings of the temperature.



ResultsPlus
Examiner Comments

This is a typical example of a student response to this question. The student gained one mark for a description of how the *Daphnia* can be immobilised with cotton wool. If the student had suggested submerging the bulb of the thermometer then a second mark point (mark point 3) could have been awarded.

(a) Suggest how the student should position the *Daphnia* and the thermometer in order to obtain valid results.

(3)

Student should position the ~~Daphnia~~ *Daphnia* in a position such that the heart is visible, so preferably trap it in cotton wool. The student should also position the thermometer into the pond water such it covers the whole body.



ResultsPlus
Examiner Comments

This is an example of a response that gained all three available marks (mark points 1, 2 and 3).

Question 8 (b)

A large proportion of students failed to gain any marks for this question. Many described elaborate methods for recording the number of heart beats but failed to give the basic ideas that counting must be for a reasonable set period of time and that observations need to be repeated.

(b) Describe how the student should take counts of the *Daphnia*'s heart rate at 20 °C to obtain reliable results.

(2)
The student should count the heart beat of the *Daphnia* for about a ~~every~~ 15 to 20 second period and then multiply this the result by 3 to get the answer in beats per minute.



ResultsPlus
Examiner Comments

In this response the student has described how to count the number of heart beats over a reasonable period of time and then convert this to a heart rate. This response gains marking point 2. The student made no mention of repeats so does not gain marking point 1.

(b) Describe how the student should take counts of the *Daphnia*'s heart rate at 20 °C to obtain reliable results.

(2)

Use a pencil to tap a piece paper for every heart beat for 30 seconds then count the number of pencil marks and multiply it by 2.
Repeat with other *Daphnia*



ResultsPlus
Examiner Comments

This response gained both marks. The student described how to count the number of beats per minute and suggested that the observations be repeated.

Question 8 (c) (i)

This question was generally answered well with the majority of students correctly describing the need to allow the Daphnia to acclimatise.

(i) Suggest why the student waited for a few minutes before counting the heart rate at 10 °C.

(1)

It gives the daphnia some time for it to accommodate/acclimatise to its surroundings.



ResultsPlus

Examiner Comments

In this response the student has clearly identified that the delay allows the Daphnia to acclimatise to its surroundings, gaining the mark.

(i) Suggest why the student waited for a few minutes before counting the heart rate at 10 °C.

(1)

To check the affect on temperature in daphnia.



ResultsPlus

Examiner Comments

This response is ambiguous and could not be credited with the mark. Students needed to make it clear that waiting allowed the Daphnia to adjust or acclimatise to the temperature of the water.

Question 8 (c) (ii)

Many students recognised that too high a temperature might damage or kill the Daphnia (mark point 2). Relatively few commented on the idea that it would be easier to count the heart beats at lower temperature (mark point 1). Many suggested that it would be easier to increase the temperature of the water surrounding the Daphnia than to cool it down. This idea was ignored - warm water could be quickly exchanged for cooler water by pipetting. Some described denaturation of enzymes without linking this idea to harming the Daphnia.

(ii) The student repeated the investigation at 30 °C.

Suggest why the student chose to do the 10 °C investigation before the one at 30 °C.

This is due to 30 °C being too hot⁽²⁾ which could possibly kill the Daphnia. If this was to occur, the student would have already obtained results for the temperature being at 10 °C. Also, if the Daphnia was killed, another Daphnia would have to be used and this would not make the experiment very accurate and fair.



ResultsPlus
Examiner Comments

This is a typical response, in which the student clearly links the higher temperature to a risk of death of the Daphnia, gaining one mark (mark point 2).

(ii) The student repeated the investigation at 30 °C.

Suggest why the student chose to do the 10 °C investigation before the one at 30 °C.

(2)

There is a risk of the daphnia being killed at 30°C. At 10°C, the heart rate would be slower and easier to count. At 30°C, it would be harder to count as it is faster. If the daphnia died at 30°C, he wouldn't be able to do it at 10°C.



ResultsPlus
Examiner Comments

This is an example of a good response in which the student gains two marks. The first mark for linking high temperature with the risk of death of Daphnia (Mark point 2) and the second mark for it being easier to count the heart beats at a lower temperature (converse of mark point 1).

Question 8 (d) (i)

Many students found this question difficult. Often, rather than explain the effect of increasing temperature, they gave detailed descriptions of the effect of temperature changes on heart rate of the *Daphnia*.

Most of those students that attempted an explanation gained the last marking point for the idea of increased metabolism/respiration. Only a relatively small number of students were able to make the link between temperature, enzyme activity and then respiration in the context of this investigation.

(i) Using the information in the table, explain the effect of temperature on the heart rate of *Daphnia*.

(3)

As the temperature increases, the mean heart rate of the daphnia increases. Only a slight increase between 10°C and 20°C, in daphnia 2 was the same, but a further increase of 10°C to 30°C almost doubled the mean heart rate in all the daphnia.



ResultsPlus
Examiner Comments

This is a fairly typical student response to this question. The student gains one mark for describing the increase in heart rate with increased temperature (mark point 1). The rest of the response was not relevant and gained no further marks.

- (i) Using the information in the table, explain the effect of temperature on the heart rate of *Daphnia*.

(3)

As temperature increases, mean heart rate of *Daphnia* increases. Temperature increases enzyme activity, there are more collisions between enzyme molecules and substrate molecules to form enzyme-substrate complexes. The *daphnia* becomes more active at high temperature, it has higher metabolic rate, the heart has to pumped faster so that more blood ~~can~~ ^{is} available for the *daphnia*.



ResultsPlus
Examiner Comments

This is an example of a good response that gains all three available marks. The student first notes that increased temperature results in an increased heart rate (mark point 1), then links an increase in temperature with increased enzyme activity (mark point 3) and finally to an increased metabolic activity (mark point 5).

Question 8 (d) (ii)

Most students found this question straightforward and frequently gained two marks. Mark points 2 and 3 were the most frequently seen marks.

(ii) The student decided not to carry out the investigation at 40 °C and 50 °C.

Suggest **two** reasons why the student decided not to carry out the investigation at these temperatures.

(2)

1 At 40°C and 50°C the heart rate may be too fast to over count and hence the results could not be reliable or valid as errors in counting.

2 At these temperatures there is a high chance for the Daphnia to increase heart rate so much that it may die.

(Total for Question 8 = 13 marks)

TOTAL FOR PAPER = 80 MARKS



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Examiner Comments

This is typical of the answers seen for this question. The student gained both marks for suggesting that at the higher temperatures the heart rate would be too fast to count (mark point 1) and that the high temperature might harm the Daphnia (mark point 2).

Paper Summary

Based on their performance on this paper, candidates are offered the following advice:

- Read the whole question carefully, including the introduction, to help relate your answer to the context asked. You should read the question through carefully at least once and then write down your knowledge and understanding in a way that answers the question;
- Don't assume that the question asked is the same as that which has appeared on a previous paper;
- Read your answers back carefully – do they answer the question? have you made at least as many clear points as marks are available?;
- When asked to distinguish between two things make sure your answer is comparative and mentions both things being compared;
- When asked to describe a trend this is asking for the overall changes and not a detailed description of individual points on a graph or in a table;
- Include a relevant calculation whenever you are asked to describe or compare numerical data in tables or graphs;
- Don't be afraid to include a sketch diagram or graph if it adds clarity to your answer;
- When describing the measurement or control of variables, be specific about what is to be measured e.g. volume or mass, and avoid vague terms such as amount;
- Pay particular attention to spelling, the use of technical names and terms, and organisation of your answer in QWC labelled extended writing questions;
- Explore and assess examples of candidate responses from this report to help you understand what makes a good response to different types of questions, and exemplify the level of knowledge and understanding expected at AS level.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:

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